

**Abstract**

An authentication system using a correlator that correlates an input with a reference wherein at least one of the input and reference comprises a phase volume mask having structures, preferably points, that are each less than about six microns in size and can have an aspect ratio (AR) greater than 1:1 so as to produce a phase encoded random pattern having millions of combinations in a mask that is as small as one square millimeter. The random pattern can be convolved with a second pattern, such as a biometric pattern, to produce a phase convolved mask. The correlator preferably is a nonlinear joint transform correlator that can use "chirp" encoding to permit the input to be located in a different plane than the reference. The correlator optically Fourier transforms images of the reference and input that are thereafter nonlinearly transformed and inverse Fourier transformed by a processor to determine the presence or absence of a correlation spike indicative of authenticity. A spatial light modulator (SLM) can be used as an input or reference and preferably is a liquid crystal panel having pixels or elements whose phase or grey scale intensity can be selectively controlled by a processor. The SLM can be used to display a biometric pattern, preferably scanned in real time from a person, that is correlated against an input or reference that can comprise a label on a card, a tag, or another object.